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Maths Challenger #1

For distribution **if** a group has **completed** Paper 3 and there is remaining time. These questions are **not recorded** in the Members Portal.

Pages of a Book

Pat reads 1 page of a certain novel every Monday, 2 pages every Tuesday, 3 pages every Wednesday, and so on up to 7 pages every Sunday.

She reads every page exactly once and does not skip any days.

If Pat starts reading page 1 on a Monday and reads the pages in order, on which day of the week does she read page 100?



Write your answer in this box.







Maths Challenger #2

For distribution **if** a group has **completed** Paper 3 and there is remaining time. These questions are **not recorded** in the Members Portal.

Cereal Box Stack

A supermarket packer makes a solid pyramid out of identical cereal boxes.

Five layers are shown.

What is the total number of cereal boxes in these five layers?



Write your answer in this box.



	3A: 24	3B: 13	3C: 32	3D: 75	3E: 21				
3A.	Autumn Leav	es							
	Layla is collecting autumn leaves. On the first day, she collected 3 leaves. On Day 2, she collected 6 leaves On Day 3, she collected 9 leaves. If this pattern continues, how many leaves will she collect on Day 8?								

Strategy: Build a Table and Find a Pattern

Let's look at the information recorded in the table and see if there is a pattern in the sequence.

Each day, the number of leaves that Layla collects increases by 3.

Let's continue that pattern in the table.

If we continue the pattern up to Day 8, we can see that on that day Layla will collect **24 autumn leaves.**

Day	1	2	3	4	5	6	7	8	
Number of Leaves	3	6	9						
+3 +3									

Day	1	2	3	4	5	6	7	8
Number of Leaves	3	6	9	12	15	18	21	24
		+3	+3	+3	+3	+	3 +	.3

Strategy: Build a Table and Find a Rule

Some students may look at this table and identify a function rule.

They will consider that Day 1 has 3 leaves, Day 2 has 6 and Day 3 has 9.

The number of the day can be multiplied by 3 to find out how many leaves were collected.

8 × 3 = **24.**

On Day 8 Layla will collect **24 autumn leaves.**

Day	1	2	3
Number of Leaves	3	↓ 7 6	∀ 9

Day	1	2	3
Number of Leaves	↓ ^{×3}	↓ ^{×3}	↓ ^{×3}
	3	6	9





Term 1

MATHS EXPLORER **3**

Term 3

3B. Block Pattern

The question is:

I am using blocks to make a pattern.

I have made the first 3 terms.

How many triangles do I need to make the 6th term?

Strategy: Draw a Diagram

The question finishes with Term 3. We need to find how many triangles are needed to build Term 6.

We can use pencils or pens to increase Term 3 to Term 6, recording each term as it is added to the diagram.

To find how many triangles we need to build Term 6, carefully tally all the triangles. You need **13 triangles** to build Term 6.

Strategy: Build a Table and Find a Pattern

Build a table to record how many triangles there are in each of the first 3 terms.

We can see a pattern in the table.

Each time there is a new term, there are 2 more triangles in that term than in the term before.

Continue this pattern to find out how many triangles there will be in the 6th term.

There will be 13 triangles.



Term 2

Pattern Term:	1	2	3	4	5	6
Number of Triangles:	3	5	7			

Pattern Term:	1	2	3	4	5	6		
Number of Triangles:	3	5	7					
$\langle \gamma \rangle$								

Pattern Term:	1	2	3	4	5	6
Number of Triangles:	3 5		7	9	11	13
	+	2	+2 +	2 +	2 +	-2







MATHS EXPLORER **3**

3C. Comic Book

The question is:

Wendy borrowed a comic book from the library.

On Day 1, she read 5 pages.

Every day that followed, she read 3 more pages than she read the day before.

How many pages did she read on Day 10?

Strategy: Build a Table and Find a Pattern

Build a table to record how many pages Wendy reads on each of the first 3 days.

Day:	1	2	3	4	5	6	7	8	9	10
Number of Pages:	5	8	11							

We can see a pattern in the table. Each new day, Wendy reads 3 more books than the day before.

We can continue this pattern to find out how many pages she read on Day 10. Wendy read **32 pages** on Day 10.

Day:	1	2	3	4	5	6	7	8	9	10
Number of Pages:	5	8	11							
+3 +3										

Day:	1	2	3	4	5	6	7	8	9	10
Number of Pages:	5	8	11	14	17	20	23	26	29	32
	+3	+	3 1	+3	+3	+3	+3	* +	3	+3

Strategy: Simplify the Problem and Reason Logically

If we were to pretend Wendy read 3 pages on her first day, the problem is a little simpler because the pattern we would see would be 3, 6 and 9 and so on, which are all multiples of 3.

Using this we can quickly work out that on day 10 Wendy will read 10×3 pages = 30 pages.

However, we know that Wendy actually read 2 extra pages on the first day. And since every day she read 3 more than the previous day, those 2 pages carry on into all the following days.

This means that on day 10 she read 30 + 2 pages, **32 pages**.



3D. Gardening

If a gardener takes 15 minutes to plant 3 trees, it takes 2 hours to plant a whole row of trees. The second row already has 9 trees planted. How many minutes will it take the gardener to completely fill this second row with trees so that it has the same number of trees as the first row?

Number of Minutes

Number of Trees

Number of Minutes

Number of Trees

15

3

15

3

+3

+3

30

6

30

6

+3

+3

45

9

45

9

+3

+3

75

15

75

15

+3

60

12

60

12

+3

+3

90

18

 $5 \times 15 = 75$

90

18

+3

105

21

105

21

+3

+3

120

24

120

24

+3

+3

Strategy: Build a Table and Find a Pattern

Let's build a table to record the information we have been given in the problem.

We know that the gardener plants 3 trees every 15 minutes.

She works for 2 hours, which is 8 lots of 15 minutes.

By adding 3 trees every 15 minutes, we find that she has planted **24** trees in 2 hours.

The second row already has 9 trees planted.

To have the same number of trees as the first row (24) the gardener will need to plant 15 more trees.

We can see in our table that there are 5 sets of 3 trees to plant, and each set will take the gardener 15 minutes.

5 × 15 = **75 minutes.** (1 hour 15 minutes)

Strategy: Draw a Time Line

We know the gardener works for 2 hours and plants 3 trees every 15 minutes. Let's draw a time line to record the number of trees she has planted.



The second row already has 9 trees planted. This is 3 sets of 3 trees. She needs to plant another 5 sets of 3 trees to complete the row.

So we only need to start counting time when she starts planting the tenth tree.



We can see on the time line how long it will take the gardener to plant 15 more trees to complete the row of 24 trees. It will take the gardener **75 minutes.** (1 hour 15 minutes)





MATHS EXPLORER **3**

3E. Matchstick Pattern

The question is:

I am using matchsticks to make a pattern.

I have made the first 3 terms.

I want to make term 8.

I have 20 matchsticks. How many more will I need?

Strategy: Draw a Diagram

The question finishes with Term 3. We need to find how many matchsticks are needed to build Term 8.

We can use pencils or pens to increase Term 3 to Term 8, recording each term as it is added to the diagram.

To find how many matchsticks we needed to build Term 8, carefully tally all the matchsticks.

You need **41 matchsticks** to build Term 8.

As I already have 20 matchsticks, I need **21 more** to be able to build term 8.

Strategy: Build a Table and Find a Pattern

Build a table to record how many matchsticks there are in each of the first 3 terms.

We can see a pattern in the table.

Each time there is a new term, there are 5 more matchsticks that term than in the term before.

Continue this pattern to find out how many matchsticks there will be in the 8th term.

I will need 41 matchsticks to build Term 8.

As I already have 20 matchsticks, I need **21 more** to be able to build term 8.







Pattern Term:	1	2	3	4	5	6	7	8
Number of Matchsticks:	6	11	16					

Pattern Term:	1	2	3	4	5	6	7	8
Number of Matchsticks:	6	11	16	21	26	31	36	41
+5 $+5$ $+5$ $+5$ $+5$ $+5$								





MATHS EXPLORER **3**

Solution: Page 100 is read on **Saturday**.

Pages of a Book

Pat reads 1 page of a certain novel every Monday, 2 pages every Tuesday, 3 pages every Wednesday, and so on up to 7 pages every Sunday.

She reads every page exactly once and does not skip any days.

If Pat starts reading page 1 on a Monday and reads the pages in order, on which day of the week does she read page 100?

Strategy: Find the number of pages read per week

Each week Pat reads:	In 3 weeks Pat reads:				
1 + 2 = 3 pages by Tuesday	$3 \times 28 = 84$ pages.				
3 + 3 = 6 pages by Wednesday					
6 + 4 = 10 pages by Thursday	This leaves 16 pages more to read.				
10 + 5 = 15 pages by Friday	15 of those pages (from page 85 to page 99) are				
15 + 6 = 21 pages by Saturday, and	read by Friday.				
21 + 7 = 28 pages for the whole week.	Therefore, page 100 is read on Saturday .				





MATHS EXPLORER **3**

Solution: In all there are **100 cereal boxes**.

Cereal Box Stack

A supermarket packer makes a solid pyramid out of identical cereal boxes.

Five layers are shown.

What is the total number of cereal boxes in these five layers?



Strategy: Break up the problem by layers, and make a table.

The top layer has 1 row of 4 boxes.

The next layer has 2 rows of 5 boxes each.

The third layer has 3 rows of 6 boxes each.

The fourth layer has 4 rows of 7 boxes each.

The fifth layer has 5 rows of 8 boxes each.

Make a table showing each number of rows and the number of boxes in each row.

Layer	# of rows	×	# of boxes per row	=	# of boxes per layer
Тор	1	×	4	=	4
2	2	×	5	=	10
3	3	×	6	=	18
4	4	×	7	=	28
5	5	×	8	=	40
			Total	=	100

In all there are **100 cereal boxes**.